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ABSTRACT

As teachers and learners are faced with the potential of new learning environments, the extent to which the learning outcomes are achieved remains a high priority and subject to a wide range of evaluation strategies. Conventionally, evaluation is often conceptualized as occurring at the end of the development process, to assess first (formatively) whether or not the creative effort has achieved the original product goals and second (summatively) whether or not the desired learning outcomes were achieved. This paper presents an additional perspective to the post-development, reactive evaluation processes in proposing the concept of proactive evaluation. This framework identifies the following critical online learning factors and influences to better inform the development of learning resources: strategic intent; content; learning design; interface design; interactivity; assessment; student support; and outcomes. In essence, the proposal advocates an approach where development is undertaken within an environment where all activities are assessed using the evaluation criteria that would be applied when the product is assessed reactively. By performing these checks proactively, online learning resources will, in principle, work first time as all relevant factors and issues will have been considered and resolved. (Contains 10 references.) (Author/MES)

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PROACTIVE EVALUATION: NEW PERSPECTIVES FOR ENSURING QUALITY IN ONLINE LEARNING APPLICATIONS

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Abstract

A major issue confronting educators is the extent to which they wish to conform to so-called paradigm shifts in teaching and learning. In the contemporary world of tertiary education these shifts embrace both pedagogy (from instructivist to constructivist) and technology (classroom to online). As teachers and learners are faced with the potential of these new learning environments, the extent to which the learning outcomes are achieved remains a high priority and subject to a wide range of evaluation strategies. Conventionally, evaluation is often conceptualised as occurring at the end of the development process, to assess first (formatively) whether or not the creative effort has achieved the original product goals and second (summatively) whether or not the desired learning outcomes were achieved. However, in the context of imperatives to implement online learning paradigms, the level of understanding teachers and developers have of the medium can impact the effectiveness of the product. This paper presents an additional perspective to the post-development, reactive evaluation processes in proposing the concept of proactive evaluation, a framework that identifies critical online learning factors and influences to better inform the development of learning resources. In essence, the proposal advocates an approach where development is undertaken within an environment where all activities are assessed using the evaluation criteria that would be applied when the product is assessed reactively. By performing these checks proactively, online learning resources will, in principle, work first time as all relevant factors and issues will have been considered and resolved.

Keywords

evaluation, online learning, educational design, quality assurance

Introduction

The imperative for tertiary education providers to embrace online learning as the primary mode for access to teaching and learning resources has never been greater. While many practitioners are familiar with the issues and processes associated with the production of these materials, institutions are demanding their creation without necessarily having staff competent in all aspects of the online paradigm. At the same time, research studies have demonstrated online environments to have both positive and negative impacts in terms of effectiveness and achievement of outcomes (Franklin, Peat, Lewis & Sims, 2001). Given this environment, it is critical that online development projects

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implement levels of quality control to ensure the learners receive the most effective resources. The most frequent form of quality assessment within the educational environment is that of evaluation, which is typically conducted at the end of the development process through formative and summative techniques. As a component of the educational development process, evaluation is also frequently discussed in the last chapter in textbooks (for example Smith & Ragan, 1999; Morrison, Ross & Kemp, 2001), reflecting a perceived position within the overall process. While critical for assessing quality and outcomes, this form of evaluation is often undertaken reactively, examining the functionality of the learning resources and the achievement of the associated learning objectives after the materials have been developed and implemented. The evaluation data thus collected can then be used to inform developments for and maintenance of those resources.

As an addition to this environment, and to provide specific support for the creation of online materials, this paper argues for a reconfigured development environment in which alternative elements of evaluation are integrated into all considerations of the design process. In concept, the production team are exhorted, through a proactive evaluation framework, to focus on the criteria by which their products and resources would be evaluated and thereby ensure that all factors associated with a successful evaluation are addressed during the design and development process. Theoretically, a product created using proactive evaluation will be more likely to achieve the educational and learning goals. More importantly, this paper is not suggesting a replacement of formative and summative evaluation protocols, as these are critical to the iterative nature of educational development. However, it is argued that the strategies proposed provide an integrated framework for an online pedagogy, and the proactive aspect places evaluation within all facets of the design, development and implementation process, as recommended by Sims (1997a).

Proactive Evaluation

The following classification of factors and associated influences provide the basis for a concept referred to as *proactive evaluation*. The essence of this concept is that by first considering the complex interactions between educational design and online environments, designers and developers with new or limited skills in online learning will reduce the risk of producing poor-quality or ineffective materials as well as the likelihood of critical, negative evaluation. The ideas presented can be viewed as an extension to current practice in instructional or learning design, as many of the factors identified stem from that theoretical base. However, the underlying principles assume that the environment for which the development is being undertaken is not a traditional instructional setting, but an online world in which the familiar relationships between teacher, learner and content no longer always hold true. By applying the proactive evaluation concept, development teams will not only ensure all aspects of creating online learning resources and activities are addressed, but that subsequent formative and summative evaluation will be more rigorous and meaningful. In addition, the concept focuses the decision making process on the complex interaction between disciplinary content, learning outcomes and computer-based learning environments. Better understanding and addressing these relationships will consistently produce more effective teaching and learning resources.

Strategic Intent

One of the first questions we always ask our clients is "Why are you attempting to place these resources or activities into an online context"? If they are unable to provide an explicit answer, then we argue that the strategic intent or rationale for the product has not been defined adequately. Without a clear understanding of the purpose of the product and the stakeholders who have an investment and/or interest in its outcomes, the chances of success are reduced. Within the tertiary education environment specifically, these stakeholders include the administration, the faculty, the development group and most importantly the students. Without full commitment to the concept from all stakeholders, even with the best intentions, effectiveness in terms of learning outcomes being achieved may not be realised.

The critical issue therefore is the extent to which the online component(s) being considered will

add value to the teaching and learning process. For example, if an institution decides to "go online" without allocating sufficient funds to recreate materials so that they will be consistent with learner-computer communication, then the decision could prove extremely costly with few, if any, positive educational outcomes. Indeed, anecdotal feedback is suggesting a rebellion against online materials, such as the case where they are perceived by faculties as an economic solution to government cutbacks and workload increases. In other cases, where "online" has been introduced to reduce class contact time, student anger has resulted with resentment for being *short-changed*, not to mention issues of quality.

Content

Many online projects have focused on the conversion of existing paper-based resources into their digital equivalent, with a proliferation of unit outlines and study guides in either HTML or .PDF formats made available for student access. But this is not online learning, and if portrayed as such is a misrepresentation of the capabilities and benefits of the technology. If content materials and learning activities are to be placed online, then significant levels of thought must be placed on the very nature of the medium and the underlying implications for teaching and learning.

As represented by the content options identified in Table 1(a), the online environment caters for a range of content formats: from predetermined static elements to a more dynamic state where content is sourced, repurposed, constructed and enabled by and for all participants in the learning process. Between these two extremes are the more typical options for delivery of course content in terms of resource material being contributed to by both the teacher and the learner.

STATIC ◄----------				----------► DYNAMIC
Predetermined and Presented	**Teacher Contributed**	**Learner Contributed**	**Captured Dialog (Interactivity)**	**Constructed**
Content defined and prescribed by the teacher, and does not change during the delivery cycle.	Content defined and prescribed, but additions or modifications made by teacher if and when required.	Content defined and prescribed, but learner additions and contributions enhance the resource base.	Through collaborative endeavours, content material is added to the overall resource base for the program.	Content defined through research by participants and subsequent interpretation and construction.

Table 1(a): Options affecting online content

To fully exploit the online environment means having to reassess the overall approach to the content, how it should be presented or accessed and the relationship between teacher and learner in that process. In addition, the options for unit or course content should be considered in terms of the interaction with the major design issues and their impact on the learning community. As detailed in Table 1(b), these issues have a significant impact on the presentation of the content and subject matter in the broader learning process. Implicit in this framework is the assumption that content can no longer be seen as being "owned" by the teacher or discipline, but rather as an information base that can be perceived and worked with in many different ways.

An illustration of the interplay between content creation and design parameters can be seen when an online environment enables learner-creation of content. While the information itself may be linked directly to the discipline, the environment enabling it to be created dynamically may conflict with accepted organisational or design standards. In developing online content the critical element of the process is to recognise this possibility and to be able to justify why specific decisions have been taken.

COMPONENT	Issues
Structure Organisation & Information	If adopting strategies that enable the dynamic construction of knowledge, traditional forms of information presentation may have to be modified.
Matches Goals & Outcomes	The extent to which program goals and objectives are predefined may be affected by strategies that enable the learner to use knowledge construction techniques.
Contextual and/ or Situated	With a dispersed cohort of learners, content must be considered in terms of the context in which the learner is situated rather than that of the teacher's particular experience.
Information Accuracy, Integrity & Totality	Recognition of the learners' ability to contribute to the knowledge base presents questions as to accuracy and integrity – from whose perspective are these characteristics of the content to be measured and assessed?
Accessibility	A function of the technology (adaptable for handicapped users, uses appropriate plugins and bandwidth) but also includes accessibility in terms of appropriate language use (terminology, right level and even right language).
Extensibility of Content	Is the discipline base so rigid that no options for new content are considered possible, or can new alternatives be considered for collaboratively constructing and extending the knowledge base?
Quality of Expression (language, grammar, image resolution)	To what extent can traditional norms for quality of presentation be maintained if a more dynamic approach to content is considered appropriate, and what impact might this have on roles in the development process?

Table 1(b): Online content – Major components

Learning Design

The term *learning design* is used to emphasise the learner-centred environments online resources can provide. Taking this stance is particularly important because it forces designers to conceptualise the development process from the learner's perspective rather than that of the content. However this does not preclude developers from adopting an instructivist (I) or presentational strategy compared to a constructivist (C) or generative approach, but does require careful thinking about the learner and the options provided for interacting with the content and their learning partners. As shown in Table 2(a), the design of resources will be influenced by the pedagogy, outcome and resources considered appropriate for the task.

I ⟵ Pedagogy ⟶ C	Learning Outcome	Resources
Individual teachers and learners have different philosophies on the most appropriate ways that knowledge is gained and learning acquired. As online environments can be perceived as supporting the constructivist paradigm, adopting rigid instructivist strategies may degrade the overall effectiveness of the encounters experienced by the learners.	These options link learning strategy to outcome and affect each component of learning design: problem solving; declarative knowledge; concept learning; principle learning; procedural learning; cognitive strategies; attitude & motivation and psychomotor (Smith & Regan, 1999).	The ways in which media elements are used and extent to which they are accessible will influence the individual components of learning design.

Table 2(a): Options affecting online learning design

Within the context of the design process, the team should be able to articulate the underlying pedagogy of the product, the different types of learning being addressed and the ways that media resources will be used to enhance the learning environment. When considered in terms of the specific issues that are critical to the overall design task shown in Table 2(b), the complexity of addressing educational and technological elements of the process is further emphasised. Embarking on the design and development of resources for online environments requires new layers of thinking to be added to the well-established principles of course development.

COMPONENT	Issues
Prior Experience	Online learning is a new environment, and learners must have the requisite skills to effectively work within this paradigm.
Approaches to Learning	Does the provision of a range of media elements provide learners with the resources necessary to meet their approach to learning, and what impact will this set of options have on the overall development effort?
Learning Environment	The extent to which the environment is designed as a digital page or a virtual world will impact on the overall development effort (see Interface Design).
Pathways/ Sequencing	The strategies for online learning can establish predefined pathways or enable students to explore and discover different facets of the content. Managing these options to minimise information overload becomes critical.
Outcomes	In providing an online environment, are the stakeholders providing for a range of outcomes or are the consistent with predefined objectives.
Assessment	Closely linked to outcomes, are new forms of assessment being considered for the online environment, such as collaborative understanding and concept formation.
Level of Learning	What impact might governmental standards have on the design – and do those standards influence or constrain the preferred modes of delivery within the online contect?

Table 2(b): Online learning design – Major components

Interface Design

The interface between learner and computer is one of the most neglected aspects of online learning, and when coupled with our limited understanding of the complexities of the interactive process, suggests extensive work has to be done to achieve successful and ongoing communication between the learner and the environment. As detailed in Table 3(a), the options available for online productions can range from the non-contextual through to the theatrical, where the learner is conceptualised as an active player in the overall learning process rather than a passive observer (Laurel, 1991; Sims, 2000). Our position is that designers must spend more effort ensuring that learners are integrated into a narrative sequence of the learning process, rather than a familiar solution which sees content being presented in a glamorous and dynamic format but without necessarily achieving engagement with the content through the interface.

Non-Contextual ◄--------► **Contextual** ◄--------► **Narrative** ◄--------► **Theatrical**				
Information Design	**Interaction Design**	**Input/Output**	**Navigation Design**	**Aesthetics**
What procedures have been employed to ensure maximum communication of information?	Have the various interactivity options been catered for and communicated to the learner?	How clear are the options for entering and accessing content and responses?	Does moving between resources affect continuity of delivery or context?	How does the "look and feel" contribute to or detract from the communication experience?

Table 3(a): Influences affecting interface design

Overall, the conceptualisation of the interface must consider the strategies employed to position the learner within the *illusion* of the virtual learning environment; the way in which representations, metaphors, icons are employed to support communication; how design decisions affect connectedness and interference within the learner-computer interface and the extent to which animations and sound effects impact on cognitive load and degradation of learning (Sweller, 1988). The major issues for Interface Design are identified in Table 3(b) and are linked explicitly to the elements of Learning Design, one area that is often neglected by developers new to the creation of online resources. To maximise the online learning experience it is not sufficient to apply rigorous educational design to content materials, as the means by which that content (resource, activity, conference, reading) is presented to the learner will impact on its overall effectiveness.

COMPONENT	Issues
User comfort – connectedness	Has appropriate usability testing determined the extent to which users are able to work with the resources and make the necessary connections between content elements?
User control User centred	In what ways are users able to control the learning process and link the activities to their own learning requirements?
Supports content structure	Has the interface been conceptualised to be consistent with the content structure while maintaining acceptable standards?
Supports learning design approach	Has the interface been designed to be consistent with the particular paradigm employed for the course?
Alignment of Mental Models	What strategies have been employed to ensure the mental model of the design group has been effectively communicated to the learner?
Customisation vs Individualisation	In what ways can the learner structure the environment to meet their own individual learner needs or preferences?

Table 3(b): Online interface design – Major components

Interactivity

Interactivity is about successful communication and, in the context of online learning environments, one of the most crucial success factors. As a component of the human-computer relationship or encounter (Anderson & Garrison, 1998; Sims, 2000; Sims, 2001), interactivity can include passive presentation, navigation, undirected exploration, directed involvement and specific manipulation. The extent to which these constructs of interactivity impact on the continuity of communication between learner and interface, content, other learners or other teachers is critical to the overall effectiveness of the experience and is inextricably linked to the factors and influences associated with content, learner design and interface design.

Interactivity is not simply a function of computer-based transactions, but a fundamental success factor for teaching and learning, especially when implemented in an online context. In most cases, regardless of any virtual community that exists, the learner will be working independently and therefore the effectiveness of those communications (interactions) will ultimately determine the effectiveness and efficiency of the learning environment.

As shown in Table 4, elements of interactivity can encompass both human-computer activity and human-human communication. Through the creative process, developers must consider those aspects of both the design and interface that might enhance or impede the success of the different, but often simultaneous, interactions. The ability of the learner to "inhabit" the interactive world presented to them is naturally critical to its success as a learning environment. The way in which the motor (navigational and control interactions), cognitive (engaging and thinking aspects of the interactions) and collaborative (computer-mediated interactions with other course participants) elements of an interaction coalesce with the task being undertaken will contribute to the successful engagement of the learner with the activity.

INTERACTIVITY	Motor Cognitive Collaborative
Learner: Learner	The exchange of ideas, resources and information between learners enrolled in a course of study.
Learner : Teacher	The exchange of ideas, resources and information between learners and teachers participating in a course of study.
Learner : Content	The means by which learners access and make meaning out of web-enabled content.
Learner : Interface	The means by which learners access learning environments and the extent to which they are successful in its navigation.
Teacher : Content	The way teachers create and interact with content - see Table 1(a)
Teacher : Teacher	The support provided for of community of teachers
Content : Content	To what extent are "intelligent agents" being employed to search and update content materials.

Table 4: Elements of interactivity

Assessment

Much discussion takes place in educational institutions about how best to deploy multiple-choice or short-answer questions in online environments, and what form of authentication should be installed to verify the electronic submission of assignments or completion of remote examinations. However, these strategies seem to contradict those contemporary approaches to learning that advocate active participation by learner and teacher and enable self-assessment and reflection. One challenge therefore is to determine how you can take advantage of the online environment rather than attempt to replicate traditional testing strategies in another medium. As shown in Table 5, assessment can be teacher, peer or student directed and within that context, the way in which assessments items are presented becomes critical. The "peer-directed" option provides means for groups to determine and assess the learning outputs whereas the "student-directed" option provides for individuals to define and pursue specific learning outcomes. In addition, assessment may also focus on new environments in which the performance data is collected, such as real-world workplace environments.

ASSESSMENT	Teacher-Directed	Peer-Directed	Student-Directed
Assignments	To what extent do assessment items conform to "old standards"and what workload impact does this have on the teacher?		
Examinations	Are examinations required, such as for professional accreditation, or are other performance indicators sufficient?		
Project Work	What options are available for assessment through projects , and which of the participants is responsible for defining completion?		
Work Placement	Can performance in the workplace fulfil the learning objectives?		
Authentication	Is there concern about the integrity of assessment submissions, or are there other formats that might preclude this operation?		

Table 5: Elements of assessment

Student Support

Providing appropriate support for the learner cohort is even more critical in the online environment because in many instances they will be working independently in their preferred environment. Even though this environment may include collaborative work, the learner's only medium of communication is the computer, and therefore support becomes critical to ensure their mental model is consistent with that of the other stakeholders in the process. In addition to the typical help systems, announcements and guides, recent research (Sims, 2000) has suggested that more explicit support is required to bring the learner into the online environment, especially by eliminating assumptions that learners will know what to do and why they are doing it. The environments and issues that impact support are articulated in Table 6.

STUDENT SUPPORT	On-Campus	Mixed-Mode	Off-Campus
Auxiliary Information	How effective are the communities?		
Communities of Learners	Are they encouraged through collaborative activity or discouraged due to independent flexibility?		
Institutional Support	What expectations do you have for your students?		
Features	How do you plan to nurture students into the collaborative world of online learning?		
Personalisation	What support personnel and resources have been identified to ensure students will feel integral to the learning environment?		
Security			

Table 6: Elements of student support

Utility of Content

Within Australia, new digital copyright legislation and the proliferation of digital resources have provided incentives to focus on the international standards for online learning environments.

A crucial component of any development exercise therefore is to examine the extent to which content can be used in multiple environments (within and outside the product being developed), the means stakeholders might have to customise the materials and the interoperability between other learning objects in the wider curriculum. Complicating these factors is the increase in legislative and compliancy conditions; at the time of writing, ensuring online resources do not breach copyright and are accessible for learners with disabilities are part of the quality control process. These aspects are shown in Table 7, with the assumption that compliance will achieved by ensuring a robust technological infrastructure underpins the learning environment.

COMPLIANCE	Copyright	Accessibility	Infrastructure
Multiple Use	What benefits would accrue from a Digital Object Management		
Customisability	System (DOMS)?		
Interoperability	Are the learning objects compliant with international standards?		

Table 7: Elements of content utility

One of the complexities on online development and evaluation is that issues and factors such as accessibility impact on a wide range of environmental and operational element of online learning. For example, while legislative or policy requirements might insist on online facilities being accessible to people with disabilities, the guidelines will also impact on the look and feel of the interface and ultimately in the communication between learner and people and objects within the learning environment.

Outcomes

The final factor of the proactive evaluation framework is an assessment of the extent to which outcomes have been successfully achieved. For example, measures of learning associated with both intra-curricula and extra-curricula activities; the level of learner satisfaction with the overall experience; the completion rates and the extent to which pass rates and grades are consistent with alternative delivery options. Overall the design effort needs to include items to enable a comparative analysis of student outcomes in relation to the overall development parameters, as shown in Table 8.

OUTCOMES	Program Maintenance	Quality Audit	Teacher Performance
Learning	Very simply, did we get it right?		
Satisfaction	What needs to be done to make it better?		
Results	Knowing the parameters that will be used to validate both quantitative and qualitative outcomes of the learning experience will be critical to its ongoing success?		
Outcomes v Objectives	To what extent will the learners continue in the program and develop a sense of lifelong learning?		

Table 8: Outcomes

Conclusion

The capacity of computer-based technology to display combinations of media elements and respond meaningfully to user actions and manipulations has been established for many years. However, the power and capability of the computer to support the learning process is often lost in a maze of marketing publicity and technical gadgetry. Unfortunately, without the requisite skills, it has become all too easy to create web-based materials without understanding the underlying principles of online, interactive, engaging learning.

Rather than creating effective learning environments, many development initiatives have proven ineffective, with learning activities a confused labyrinth of information, links, colleagues, discussions and navigation. The factors and influences presented, which are considered critical to effective online learning, provide a framework for designers and developers to proactively evaluate their product. By enabling development teams to address the critical issues associated with the creation of learning resources for delivery in an online environment we will have a greater chance of ensuring the achievement of educational outcomes, with learners gaining significant value from their online experiences.

Given the complexity of this framework, and the importance of understanding the many layers of influence on developing effective online resources, perhaps the critical factor is whether online developers require a credential to practice. Indeed, the costs of implementation and the risks of failure may well make this an imperative!

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